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NOTES ON GLACIAL ACTION IN NORTHERN NEW YORK AND CANADA.

BY JOSEPH WILLCOX.

In a former communication I have noted some results from glacial action in northern New York and Canada. I have recently observed some other matters connected with the same action, in that region, viz., in Lewis, Jefferson and St. Lawrence Counties in New York, and in Canada, for a distance of one hundred and twenty-five miles north of the St. Lawrence River.

In this territory all the original soil appears to have been removed by glacial action, and that which now remains there has been deposited by the receding glacier. It is thinly distributed, seldom being many feet in depth; while, in many cases, the rocks have no soil upon them. All the rocks are extensively eroded, and those which are durable still remain smooth—both above the ground and underneath—wherever I have seen the soil removed.

In the country south of the great terminal moraine, which extends across our continent, the soil is usually deep, especially in our Southern States. The top of the rocks, under this deep soil, is ordinarily in a state of disintegration; and the different stages of transition from hard rock to soil may easily be observed. Loose stones, on top of and in the soil, are more or less decomposed on their surface, relinquishing their substance slowly, as new virgin soil, for the needs of vegetation. Where the country has been extensively glaciated, this condition of the rocks and stones does not exist, the soft portion of them having been removed by attrition, and, since the glacial times, little disintegration of the surface of the granite and Potsdam sandstone has occurred.

If the great ice sheet should have receded north speedily, by rapid melting, less material would, of course, be deposited on the ground, than in the case of a slow retrogression. In the former case little would be deposited, in any locality, except what was already on the ground, in the process of transportation.

Taking the country north of Philadelphia as illustrating probably the conditions prevailing elsewhere within the glaciated area, I have observed that north of the great terminal moraine a large

amount of silt has been deposited, as moraine material, by the receding glacier, as far north as Trenton Falls, in New York, but not much farther. On the north side of the Mohawk Valley, from Utica to Schenectady, vast deposits of glacial drift may be seen. North of Trenton Falls the deposits appear to diminish rapidly in quantity, so that I observed no large accumulations near the St. Lawrence River or north of it. The farther north I proceeded the smaller the deposits appeared to be, including the ordinary surface soil.

From the above facts I consider there are reasonable grounds for suspecting that the glacier receded slowly from Pennsylvania until its southern limit was not far north of the Mohawk River, and then it was withdrawn more rapidly, with increasing speed, as it proceeded north.

Some geologists consider that there was not a great amount of glacial erosion accomplished upon the rocks in Pennsylvania. I believe that the erosion proceeded with much greater effect in Canada than in this State. While progressing from the north the glacier would operate on the rocky surface of Canada during a long time before it would reach the latitude of Pennsylvania. Also during its decline it would still continue its abrasion in Canada long after it had retreated from our State.

I have observed, in northern New York and Canada, that where the country is level it is often covered with Silurian limestones or sandstones, but where it is hilly the Laurentian rocks usually prevail. In the latter case the Silurian rocks may have formerly existed and been removed, as they were more effectually exposed to the glacial erosion.

Many sharp, angular stones are scattered over the ground in Canada among the rounded boulders. These evidently have not been transported far from the parent rock, but they are suggestive of the fact that, even near the close of the glacier's career, rocks were still being torn into fragments. These fragments were chiefly broken loose from the southwestern portions of the rocks.

As a shallow soil prevails in the district referred to, the trees do not obtain a deep, substantial hold upon the ground; consequently they are easily blown down by the storms, and the forests are filled with prostrate trees, which make travel a difficult operation there. When the forests are cleared off, the ground is in a

very rough condition. A hole in the ground indicates the place where a tree formerly stood, while a pile of earth alongside denotes the place where the roots of the prostrated tree transported and deposited the soil that was in the hole. Large fields may be seen, the surfaces of which are almost wholly broken up into holes and piles of earth, by the prostration of trees.